

Bureau have been found valuable aids to engineers and investors. Each State is a section of the Climate and Crop Service of the Bureau, in charge of an official whose duty it is to establish stations of observation. These stations are possible through the voluntary cooperation of public spirited citizens willing to act as observers. Observations include a record of the temperature, rainfall, snowfall, cloudiness, and prevailing winds; reports are rendered monthly, and after examination and computation at the section center, the values are published in quarto form about the 15th of the following month. These printed reports, with the addition of the annual summary, furnish a convenient source of information on climatic features, and may be had free of charge upon application. A considerable number of the stations have been in operation a great many years, while reports from others cover a comparatively short period. If the monthly publication does not give a report from the locality desired, application should be made to the section director for the information, as a copy of all records made at any time within the State in question is on file; thus, in Colorado, the number of discontinued stations is three times as large as that of the stations at present in operation, although these number nearly one hundred.

Records from mountain stations being especially important in the study of precipitation, efforts have been directed, for a number of years, toward increasing the number of observers on the upper watersheds, and while the number of such observers now cooperating is larger than ever before, there is room for a great many more in every section of the arid region.

The importance of these rainfall stations is not fully appreciated by the general public. In the beginning the work of reclamation will necessarily be confined to the larger and more promising undertakings, leaving relatively small ones for later consideration. When these latter are taken in hand full information must be available regarding the rainfall and its seasonal distribution, and whether it comes in small amounts or in an occasional downpour or cloud-burst. It lies within the power of this Congress to do much to encourage persons to undertake rainfall observations in the higher altitudes of the different States. As regards the furnishing of instrumental equipment, I feel sure there will be no difficulty, for Professor Moore, Chief of the Bureau, has the hearty cooperation of the Honorable Secretary of Agriculture in all matters that will further the interests of irrigation.

HURRICANE IN THE GULF OF MEXICO.

By Capt. J. ELLIGERS, jr.

Mr. W. C. Devereaux, Assistant Observer, Havana, Cuba, forwards the following report by Capt. J. Elligers, jr., captain of the Norwegian steamship *Jason*, with reference to the hurricane of August 14 and 15. The exact location of the vessel is not known, other than as given in the extract from Captain Elligers's report:

We received a telegram at Tampico on August 11 from the United States Weather Bureau, stating that a hurricane was approaching the Mexican coast, but, as the following day did not show any signs of the approach of the storm and as our boat was new and well loaded, we sailed with a cargo of cattle at 2 p. m. of the 13th, direct for Havana. The weather was clear, with a light breeze from the east-northeast and a normal barometer. After midnight of the 13th the wind increased to a brisk breeze from the north-northeast. At 6 a. m. of the 14th, when we were about 150 miles east of Tampico, a gale suddenly blew up from the north, with heavy rain, the barometer began to fall rapidly, and the sea became very rough. The wind continued from the north with terrible force until 9 p. m. of that day, but seemed to be strongest between 12 noon and 4 p. m.; the rain fell in torrents, the air was sticky and much warmer than on the preceding day, and the sea was very rough. The barometer reached the lowest point at 8:30 p. m., one reading 29.24 and the other reading 29.13 (they were together before the storm). From 9 to 9:20 p. m. there was a dead calm; the rain had stopped, but the sea was terrible; the only thing I can compare it to is the boiling water in a mammoth kettle. At 9:20 p. m. the wind turned to south, through east, and the storm

came with a sudden rush from that direction, and the wind blew with great force until 6 a. m. of the 15th. I can not estimate the velocity of the wind, but it was very high; I had to hold myself on the boat by clinging to a stanchion with both arms, and the wheelman had to stand in front of the wheel so that the wind would blow him against the wheel and not away from it.

During the 15th the storm gradually moderated, and on the 16th the hatches, which had been closed for three days, were opened and 270 dead cattle were removed from a cargo of 613. It was by far the worst storm I ever encountered, and I have been a sailor all my life.

Abstract of log of steamship *Jason*.

Date.	Barometer.		Remarks.
	<i>Mer.</i>	<i>Inches.</i>	
Aug. 13, 1903.			
2 p. m.	762.0	30.00	Fine weather; light breeze from ene.; left Tampico.
4 p. m.	762.2	30.01	Fine weather; light breeze from ene.
8 p. m.	762.0	30.00	Do.
14, 12 midnight.	762.0	30.00	Fine weather; fresh breeze from ene.
4 a. m.	760.0	29.92	Cloudy; strong breeze nne.
5 a. m.	760.0	29.92	Do.
6 a. m.	759.8	29.91	Heavy rain; wind north, blowing up suddenly to storm.
7 a. m.	759.5	29.90	Heavy rain; wind north; storm; heavy sea.
8 a. m.	759.0	29.88	Do.
9 a. m.	758.0	29.84	Heavy rain; wind north, increasing to hurricane; heavy sea; warm and oppressive.
10 a. m.	757.0	29.80	Do.
11 a. m.	756.0	29.76	Do.
12 m.	755.0	29.72	Heavy rain; wind north, hurricane; heavy sea; warm and oppressive.
1 p. m.	752.5	29.63	Do.
2 p. m.	751.0	29.57	Do.
3 p. m.	750.0	29.53	Do.
4 p. m.	749.0	29.49	Do.
5 p. m.	747.0	29.41	Do.
6 p. m.	745.0	29.33	Do.
7 p. m.	744.0	29.31	Do.
8 p. m.	743.5	29.27	Do.
8:30 p. m.	742.8	29.24	Do.
9 p. m.	743.6	29.25	Dead calm.
10 p. m.	744.5	29.31	Hurricane.
15, 12 midnight.	745.0	29.33	Do.
4 a. m.	750.0	29.53	Do.
8 a. m.	759.0	29.88	Storm.
12 m.	761.5	29.98	Strong gale.

At 9 p. m. of the 14th a great calm, and then the wind turned from north through east to south. At 9:20 the cyclone came with a sudden rush from south, glass rising. Wind blew with terrible force right up to 6 a. m. of the 15th; after that time it went slowly down to storm, strong gale, and fresh breeze at 12 midnight of August 15-16. The sea was very rough at the time and there were heavy rain squalls all the time. During the hurricane the temperature of the air was about 31° Celsius, and before the hurricane it was not more than 27°-29° in the middle of the day. Sunday morning, the 16th, the wind was fresh breeze from east and the sea very moderate.

METHODS OF METEOROLOGICAL INVESTIGATION.

By W. N. SHAW, Superintendent of the Meteorological Office, London.

An address before Section A, of the British Association for the Advancement of Science, at Southport, England, September 10, 1903.

[Reprinted from the author's corrected separate print.]

In opening the proceedings of the subsection devoted to cosmical physics, which we may take to be the application of the methods and results of mathematics and physics to problems suggested by observations of the earth, the air, or the sky, I desire permission to call your attention to some points of general interest in connection with that department which deals with the air. My justification for doing so is that this is the first occasion upon which a position in any way similar to that which I am now called upon to fill has been occupied by one whose primary obligations are meteorological. That honour I may with confidence attribute to the desire of the Council of the Association to recognise the subject so admirably represented by the distinguished men of science who have come across the seas to deliberate upon those meteorological questions which are the common concern of all nations, and whom we are specially glad to welcome as members of this subsection. Their presence and their scientific work are proof, if proof is required, that meteorologists can not regard meteorological problems as dissociable from section A; that the prosecution of meteorological research is by the study of the kinematics, the mechanics, the physics, or the mathematics